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FUNCTION FOR THE COMPARATIVE ASSESSMENT OF ROUTE ALTERNATIVES USING A VIRTUAL TWIN (AVATAR)

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FUNCTION FOR THE COMPARATIVE ASSESSMENT OF ROUTE ALTERNATIVES USING A VIRTUAL TWIN (AVATAR)

Technical task:

The invention disclosure makes it possible to show an ideal route selection before or after a trip based on data from a reference vehicle on the alternative route, which serves as a virtual twin or avatar.

Initial situation:

When routing to a destination, today's navigation systems often suggest route alternatives that vary, for example, in terms of distance, travel time or route type. It is up to the driver to choose between the route alternatives suggested by the system. This raises the question of whether or not the driver has made the correct decision, both at the initial decision and in the further course of the journey.

Similarly, drivers regularly ask themselves whether they have made the correct decision, for example in the following situations:

- in the case of (automatic) rescheduling of the routing to avoid traffic jams
- in congestion-like situations on multi-lane roads (i.e. roads with several lanes per direction)

At present, drivers cannot make a safe decision about which alternative is the best to reach their destination with the least possible loss of time, either at the time of route planning or when rerouting or in traffic jam situations on multi-lane roads. As a result, drivers ask themselves whether or not they have chosen the fastest alternative when making their route or lane decision.

This can lead to routing uncertainty or even dissatisfaction with the navigation function used. Solutions are described in the prior art. These enable the evaluation of complete route alternatives or individual route sections between junctions, enabling the driver to assess whether he has made the right decision regarding a route alternative. In addition, the prior art includes a search for a comparison object or twins during the course of the journey. The subsequent invention report distinguishes itself from these by additionally taking into account traffic jam situations on multi-lane roads and by selecting a comparison object already when deciding on a route. The driver can directly observe the twin vehicle by a visibility of the vehicle e.g. in the further course of the journey and compare his own position with it.

Solution:

In order to avoid the above disadvantages, a function is proposed which compares route alternatives in such a way that route or lane decisions are traceable by the driver in real time and/or after reaching the destination.

For this purpose the concept of a "virtual twin" or "avatar" is introduced:

- At time t_1 a decision of the driver of an ego vehicle for a route or lane becomes necessary. Parallel to this, the system selects a reference vehicle from the immediate environment of the ego vehicle, which in the best case has a (largely) similar destination or routing.
- From time t_1+1 , the reference vehicle of the ego vehicle is pursued further and compared with the respective position of the ego vehicle.
 - In the sense of a virtual twin or avatar, this vehicle continues to follow the route alternative not selected by the ego vehicle.
 - Based on the known GPS position, driving speed etc. of the reference vehicle, a continuous comparison with the ego-vehicle can be made.
 - Based on the known traffic situation, it may even be possible to project the driving speeds and positions of the ego vehicle and the reference vehicle.
- If the reference vehicle leaves the originally planned route or the original lane of the ego vehicle at time $t_1 + x$, a new reference vehicle is selected. Using the data of this new reference vehicle, a continuous comparison with the ego vehicle can be made.

If no potential reference vehicle can be identified (regardless of the time), a journey time without traffic obstructions is assumed for the respective route section.

This function makes it possible to deduce in real time (while driving) as well as after reaching the destination whether the driver's decision for a route alternative or lane was ideal:

- If the virtual twin or avatar reaches the destination faster than the ego vehicle, the route/lane decision of the ego vehicle was not ideal.
- If the ego vehicle reaches its destination faster, the route/lane decision was ideal.

This information to compare the virtual twin or avatar and the ego-vehicle can be made available to the driver. Various alternatives would be conceivable in this respect:

- The navigation map always shows the virtual twin or avatar, so that the driver can follow the current or projected position of the reference vehicle (as a possibility for comparison) in real time.
- In the form of a digital display, for example, a display in the vehicle interior shows in real time how the driving time of the virtual twin or avatar differs from that of the ego vehicle (e.g. "60 seconds faster", "400 m ahead").
- After reaching the destination or after the end of a traffic jam, the driver is informed by how many seconds/minutes the virtual twin or avatar was faster or slower ("You were 3 minutes faster than a reference vehicle due to the rescheduling.").

Advantages:

By hypothetically driving through route alternatives with the help of a virtual twin or avatar, the driver can concentrate on the current route. On the other hand, the driver can see in real time or after reaching the destination (depending on the interpretation of the function) whether the route or lane decision was ideal or whether the virtual twin or avatar is/was slower or faster. This should reduce the driver's uncertainty and thus increase driving comfort and the acceptance of modern navigation technologies. Based on this information, a database can be built up which can be used to determine the average travel times for route sections or lanes on multi-lane roads more reliably than before.

Possible application:

The core of this idea consists of:

- (a) Navigation system with active routing (if necessary with lane-specific navigation and traffic situation)
- (b) Identification of a reference vehicle with the same destination or comparable route sections (as the basis of the virtual twin or avatar) in the immediate vicinity of the ego-vehicle at the time of route and/or lane decision
- (c) Determination of the travel speed and position of the ego vehicle and reference vehicle
- (d) Where applicable, projection of driving speed and position of ego-vehicle and reference vehicle based on known traffic situation
- (e) Comparison of position and expected travel times for reference and first-person vehicle (during the journey and/or after reaching the destination)
- (f) Display of the comparison of the reference and ego vehicle in the ego vehicle's interior (during the journey and/or after reaching the destination)
- (g) Database of average journey times for route segments, if applicable